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ANTI-THEFT ALARM FOR PORTABLE COMPUTER

A software method for causing the speaker of a portable computer to emit an audible alarm when the authorized user has set the alarm and some unauthorized person attempts to move or steal the portable computer and, in so doing, closes the cover of the portable computer.

FIELD OF THE INVENTION

The present invention relates to methods of preventing theft of portable computers. While no method or device can prevent all thefts, the present invention, because it is a software method of preventing a particular kind of common theft of personal computers, substantially increases the number of owners of portable computers who can enjoy a greater measure of protection from thefts.

Many thefts of small, valuable devices such as portable computers occur when a dishonest person seizes an opportunity. There is no master plan, no forethought. The thief sees an unguarded item, picks it up, tucks it under a coat or into a shopping bag, and disappears with it. Thieves of this sort depend on acting without being detected. The present invention, by causing an alarm to sound, will convince most thieves to bolt and run, leaving behind the portable computer.

Portable computers, as opposed to desktop computers, provide benefits to their users and owners in direct proportion to their small size. Technology has expanded to allow small laptops and notebooks and even smaller palm-sized or hand-held portable computers. The benefits of small size allow portable computers to be carried from place to place with a minimum of effort while taking up very little room in backpacks or briefcases.

Would-be thieves have not failed to notice the small size of portable computers. A computer small enough to fit into the briefcase, backpack or pocket of its owner can be hidden just as easily in the briefcase, pocket or bag of a thief.

Theft of portable computers is widespread and especially common in libraries at colleges and universities. Opportunity for theft is created when students ignore their portable computers for short time spans while they nap, turn away from their work to talk with friends, gaze over their shoulders to look out windows as they think or daydream, and drop pens or papers and bend down to retrieve them. Any place students spend time between classes studying, working on their portable computers, and talking with friends – for example, campus unions or nearby coffeehouses – presents similar opportunities for theft.

BACKGROUND OF THE INVENTION

This application claims priority to United States Provisional Patent Application Serial Number 60/124,413 filed on March 15, 1999 which is herein incorporated by reference.

Presently available anti-theft devices range from physical devices such as chains and locks to motion detectors and remotely-triggered alarms as well as internal circuitry which causes an alarm to sound when the portable computer is moved. Others rely entirely on additional internal circuitry to cause an alarm to sound when the cover is closed on the portable computer.

Current anti-theft devices include the following: U.S. patent 5,757,271 to Andrews (1998) – a two-part motion detector, with one part internal and one part external; U.S. patent 5,760,690 to French (1998) – an internal motion detector; U.S. patent 5,648,762 to Ichimura (1997) – a “docking station” attached to a work surface into which the portable computer can be inserted and literally locked-down. U.S. patent 5,872,515 to Ha (1997) teaches a hardware means of causing an alarm to sound.

All of these devices are physical, hardware devices requiring either that the device be installed inside the computer case during manufacture or that the device be attached externally. The former method limits the protection to those who buy from particular manufacturers. The latter might prevent theft but also prevents the authorized user from carrying the computer from place to place. Since ease of transport and the ability to use the personal computer in many locations are among the primary reasons for owning a portable computer, anything that prevents the authorized user from transporting the portable computer decreases the usefulness of the portable computer.

A drawback of current internally installed anti-theft devices to manufacturers of portable computers is the extra expense of buying or making the hardware, and warehousing spares for repairs. Since the trend in portable computers is for them to be ever thinner and lighter, finding a place to put hardware without impeding heat-removal airflow is another drawback. A further drawback of the existing internal devices is that computers already manufactured cannot utilize the internal devices.

A major drawback of external chains and locks for portable computers is that the chains and locks must be carried along and attached at each place the portable computer is used. These devices provide no protection at all to the forgetful who leave them home or are in too much of a hurry to use them. Many such devices are not, themselves, portable since they must be screwed down or otherwise permanently fastened to some object not easily moved, such as a table.

SUMMARY OF THE INVENTION

The present invention teaches a software method for causing the speaker of a portable computer to emit an audible alarm whenever the authorized user has left the computer in a state with the alarm activated and speaker turned on and some unauthorized person attempts to move or steal the portable computer and, in doing so, closes the cover of the portable computer.

A thief wishes to avoid detection. In achieving this, the thief nearly always tries to conceal the object being stolen. In the case of a portable computer, concealment is enhanced by making the portable computer take up the least possible room. To minimize the size of the computer, the thief will nearly always close the cover on the computer. The invention takes advantage of the thief's closing the cover. When the thief closes that cover, the invention will cause an audible alarm thereby alerting the owner and bringing attention to the act of the thief. Most thieves will leave the computer alone and flee. The authorized user will be notified of the attempt to steal the computer. The theft should be prevented.

One of the advantages of the present invention is that it provides wider availability of protection against theft than do hardware-based alarms by permitting any portable computer

user to install the software which is the disclosed invention. This will give a greater measure of anti-theft protection to those authorized users whose portable computers were not built with special, and relatively expensive, internal alarm circuitry.

Another advantage of the present invention is that an authorized user may select either to allow the speaker to emit an alarm at the maximum volume the speaker is capable of or to emit an alarm at a volume selected by the authorized user.

Another advantage of the present invention is that it permits an authorized user to select a password, a hot-key sequence, or both, whereby said authorized user may deactivate or activate the alarm feature.

Another advantage of the present invention is that it provides this wider level of protection whether a given portable computer employs an interrupt to initiate an instruction segment whenever the cover of said portable computer is foldably closed against the main body of said portable computer or if said portable computer must rely on a polling scheme for the same purpose.

Still another advantage of the present invention is that software is quite inexpensive to install. Changing the hardware internals can be quite expensive requiring various circuitry plus some quantity of labor to implement the circuitry. Installing new hardware can take substantial time. The present invention can be installed by the authorized user in a few minutes.

Yet another advantage is that the present invention, unlike the locks and chain used in some methods of preventing theft, will continue to permit the authorized user to transport said portable computer which is a major advantage and the reason for having portable computers.

DESCRIPTION OF FIGURES

Figure 1 is in two parts. Figure 1a shows a typical portable computer in an open position.

Figure 1b shows the same typical portable computer in a closed position.

Figure 2 shows a typical interrupt vector and a possible location within that interrupt vector for the interrupt that is initiated when the cover of the portable computer is closed.

Figure 3 is a flowchart of a portion of the initialization or "boot" process for the portable computer. This portion shows the flow of control during the trapping of the closed-cover interrupt address.

Figure 4 is a flowchart of the instruction segment that is executed when closing the cover triggers the interrupt. Flow of control goes to the starting address of the instruction segment which is the present invention. If the alarm is not enabled by the operating system or if the authorized user has disabled the alarm, no alarm will sound.

Figure 5 is a flowchart of an alternative method of implementing the present invention. Here, an alarm instruction process is initiated not by an interrupt but by a background program that checks at intervals whether the cover is closed as indicated by a status location

within the portable computer. If the cover is closed and the alarm is not enabled by the operating system or the authorized user has disabled the alarm, no alarm will sound.

SPECIFICATION

Portable computers contain nearly all of the major components of desktop and even larger computers. Fig. 1a, shows a portable computer 12 in the open position, meaning that the upper half, which forms the component we will call the "cover" 10, of the portable computer 12, is positioned at roughly a ninety-degree angle from the lower half or "main computer body" 13. Almost every computer must have some way of displaying information. In almost every portable computer this capability is provided by a display monitor 11 which is often an LCD or Liquid Crystal Display. This display monitor is, also almost universally, contained in the cover 10 of the portable computer 12.

The main computer body 13 of the portable computer contains much of the circuitry which will include the processor, memory, a mass storage device, and other circuitry. (Not shown.) On the outside of this main computer body lie the keyboard 15 for input and, usually, some form of pointing device, often called a "mouse"16.

The cover and main computer body are connected by a hinge 14. This permits the cover and main computer body to be foldably closed so the portable computer looks like a book, as in Fig. 1b.

One drawback of modern portable computers is that they consume a substantial amount of energy to run, substantial relative to the batteries that power them. Manufacturers strive to devise ways to extend battery life.

One common method to prolong battery life is to shut down the display when the cover is closed. This requires some way to detect if the cover has been foldably closed against the main computer body as in Fig. 1b. The detection is often made with a microswitch. The present invention is not limited to use of a microswitch. An electric eye or infrared sensor or any other means would suffice for purposes of the present invention. This invention is not concerned with the particular device or method used to detect that the cover is foldably closed against the main computer body nor is it concerned with the structure or architecture of the hardware components. It does not matter to the present invention whether the display is an LCD or a plasma screen or any other technology. The invention depends only that there be some way among the many possible ways to detect that the cover is foldably closed against the main computer body and that said detection causes some change in the portable computer's internal environment so that the software can react to that change.

It is well-known in the art to use a microswitch to detect if a cover of a portable computer is closed or open. It is also well-known in the computer art to make said microswitch send a signal to the portable computer's interrupt vector when a cover closes. Fig. 2.

An interrupt vector 20 is a portion of the processor or memory. It is a table of addresses to which control of the computer processor will be transferred upon occurrence of the particular interrupt. Such addresses are sometimes called "pointers" or "indirect addresses". They are, in effect, addresses of other addresses. By various techniques well-known in the art, such pointers or indirect addresses can in turn point to other pointers or indirect addresses forming what is sometimes called a "cascade" of pointers or indirect addresses.

The number of levels of such a cascade can vary from one to any number depending on how the programmer writes the instructions. In the present invention, the term "indirect address" is used in the well-accepted sense of applying to cascades of any number of levels.

An interrupt is a cessation of processing and almost immediate transfer of control to the interrupt vector. A computer designer or component designer designs as many interrupts as the designer deems appropriate. Each condition that might cause an interrupt has its own location in the vector. The designer may design the processor so that the interrupt vector has the interrupt locations in any order the designer deems appropriate. Control of the processor is transferred to an address stored in the interrupt vector should that type of interrupt occur. The process of doing whatever the particular interrupt requires is called "interrupt handling".

The interrupt vector 20 contains numerous locations shown as 22 and 24. Whenever one of the interrupts occur, a computer stops what it is doing, saves the address of where the instruction was that the computer was executing when the interrupt occurs, reads the address in the location of the interrupt vector corresponding to the particular interrupt 22, then transfers control of the computer to the instruction segment at the address corresponding to that address in the interrupt vector.

In Fig. 2, the interrupt vector 20 is shown with an undefined number of interrupts plus one interrupt for directing the computer to handle the cover-closed interrupt 24. The figure is for illustrative purposes only. The closed-cover interrupt location will be in whatever

location in the vector the designer gave that interrupt. The layout of the interrupt vector is a design consideration which has no effect on the present invention.

A computer program can, through various techniques well-known in the art, alter an address in the interrupt vector 20. In its simplest form, this process, known as "trapping an interrupt", is accomplished by replacing the address in the interrupt vector 20 for a particular interrupt with the address of an instruction that a programmer wishes the computer to execute instead.

Trapping is normally accomplished during the system start or "boot" process. It does not matter whether it is a cold boot - meaning starting with the portable computer shut off - or a warm boot - meaning starting with the portable computer running. The trapping is the same. Fig. 3.

Considering both Fig. 2, Fig. 3, and Fig. 4, the boot process 30 executes a portion of the instruction segment which is the present invention. That instruction segment reads 32 the address in the cover-closed interrupt location 24. Next, at 32, the instruction segment stores the address just read from the cover-closed interrupt location 24 and saves that address into the instruction segment which processes the interrupt. In Fig. 4, this address would be saved in the location for the instruction segment at 48.

Next, the boot process segment 30 stores the starting address of the instruction segment which processes the cover-closed interrupt 40 in the closed-cover interrupt location 24.

computer which does not employ an interrupt to indicate said cover is foldably closed against said main computer body. In the alternative embodiment, the present invention polls the register or status location which is changed when the cover is foldably closed against the main computer body. In said alternative embodiment there is no interrupt trapping so, in this embodiment, there is nothing to be done at boot time. The program segment must be started by the operating system or the authorized user.